

# CASE STUDY - COPPER BASED COOLING WATER SYSTEMS

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College of Knowledge

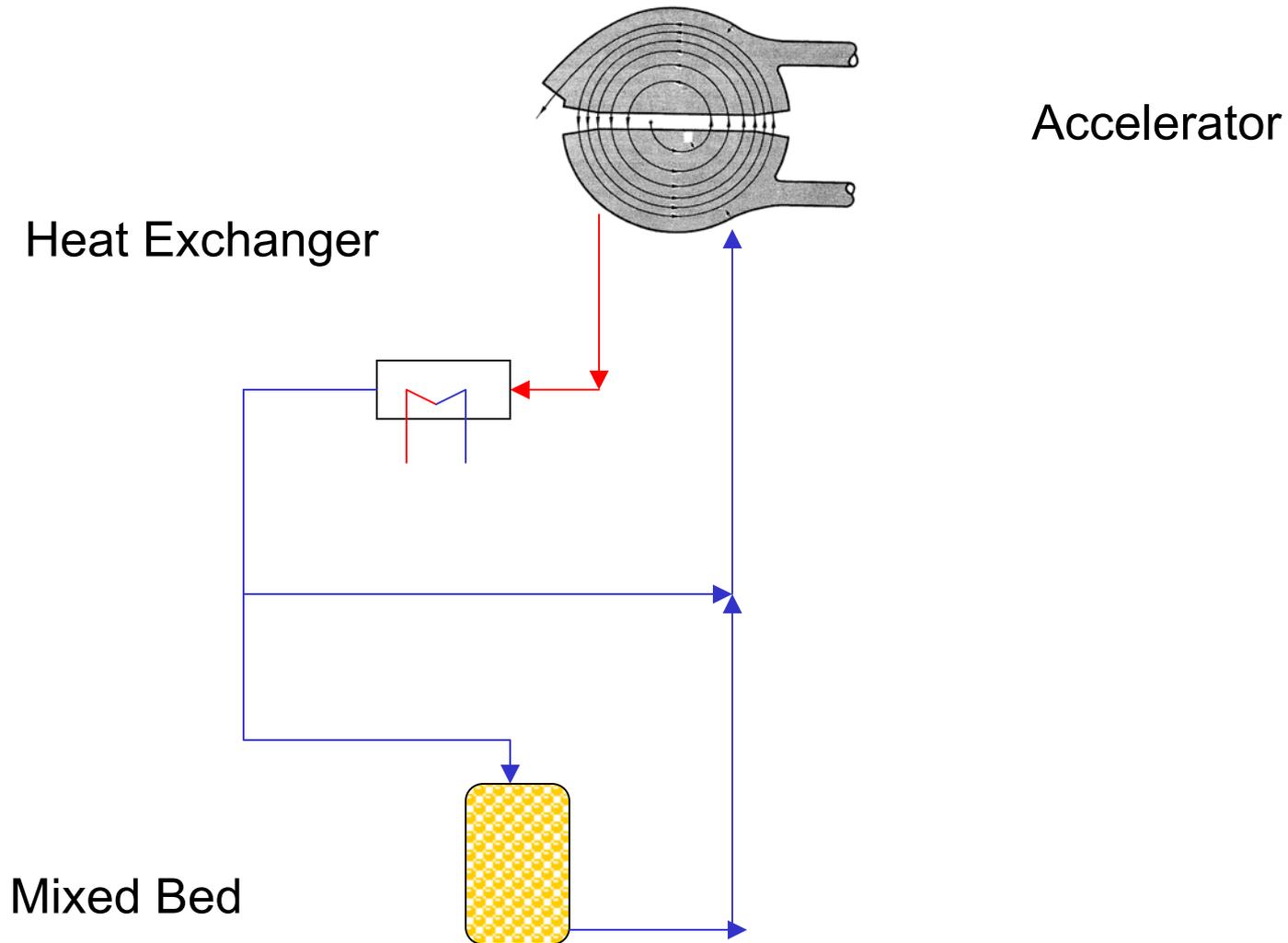
Germany



# SYSTEM CONDITIONS

- **Neutral pH, low oxygen**
- **Low conductivity < 2  $\mu\text{S}/\text{cm}$  at 77°F**
- **Single column mixed bed ion exchanger**
- **Side stream polishing**

# COOLING WATER CIRCUIT

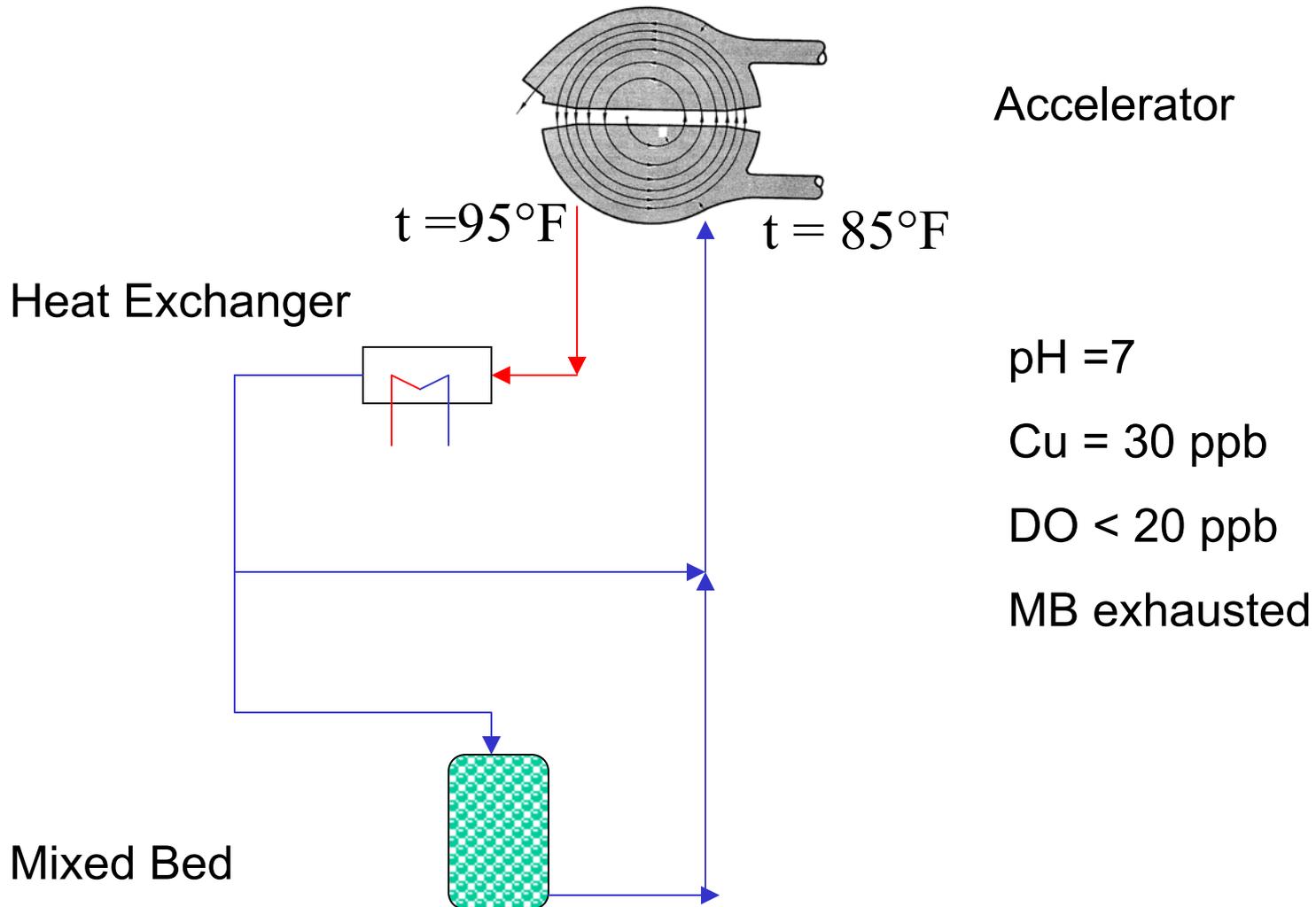


# CASE STUDY

- **Mixed bed polisher is exhausted (cation resin)**
- **pH = 7**
- **DO < 20  $\mu\text{g/l}$  as  $\text{O}_2$**
- **Copper in the circuit = 30  $\mu\text{g/l}$  as Cu**
- **Temperature at the inlet 85°F (30°C)**
- **Temperature at the outlet 95°F (35°C)**

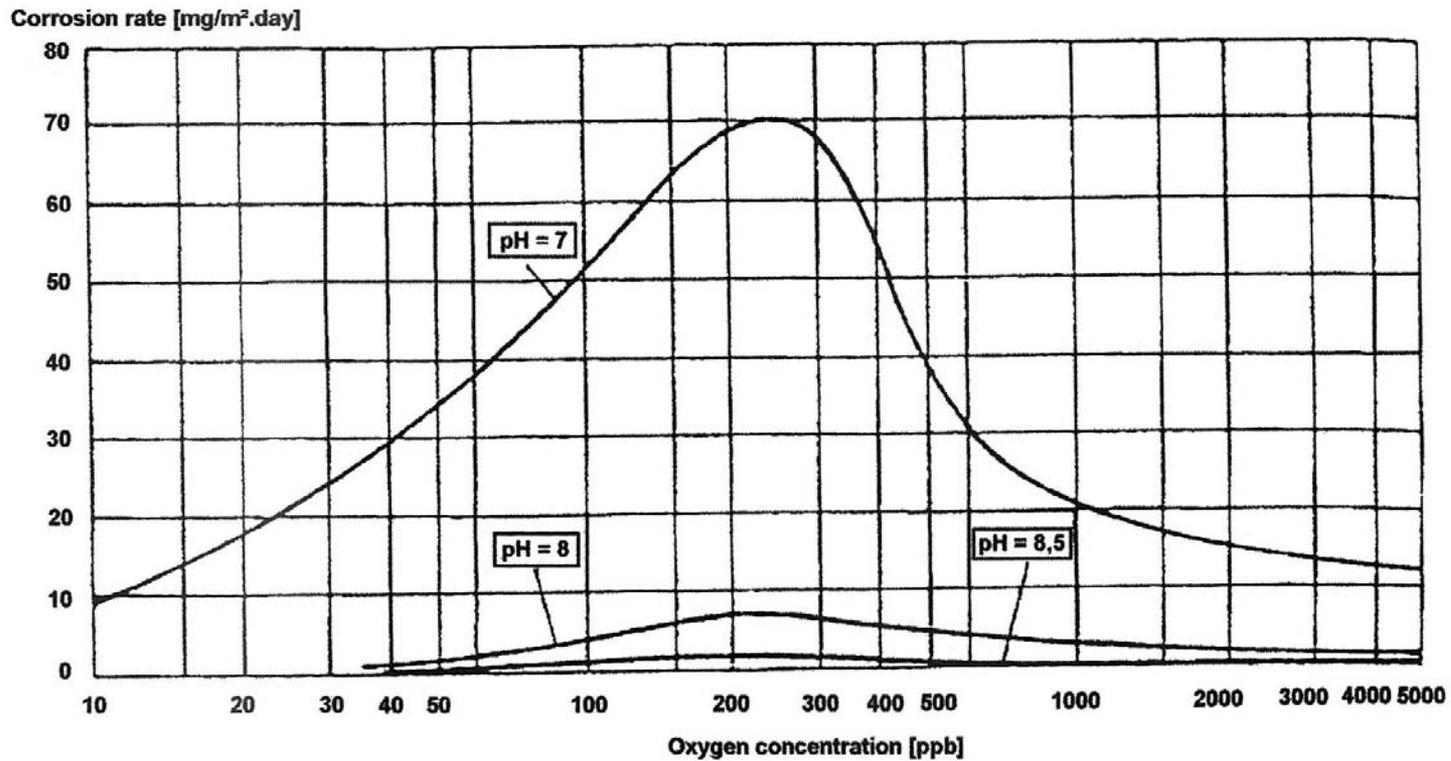
**IS THE SYSTEM AT EQUILIBRIUM?**

# COOLING WATER CIRCUIT



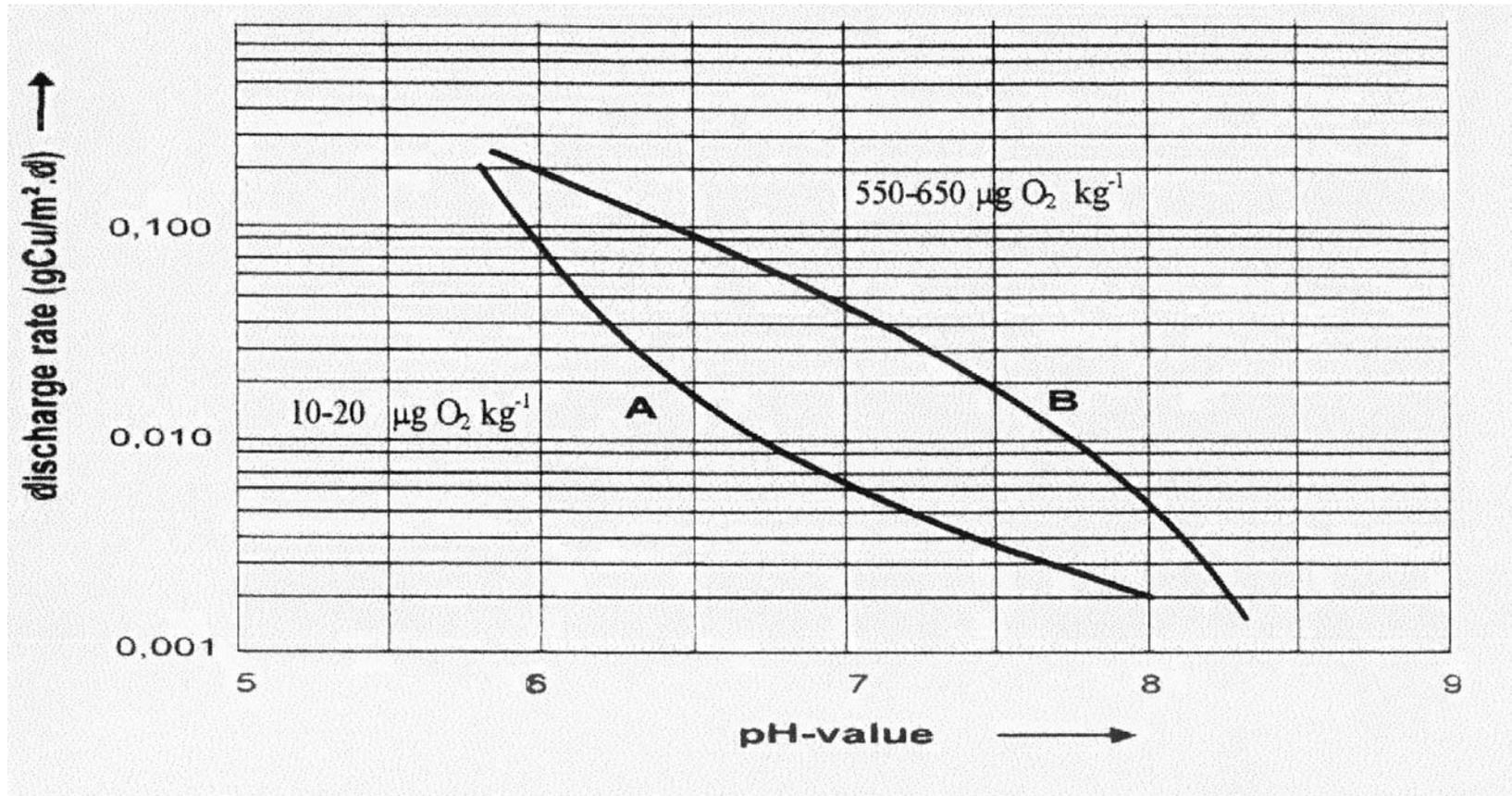


# COPPER CORROSION, pH AND DO



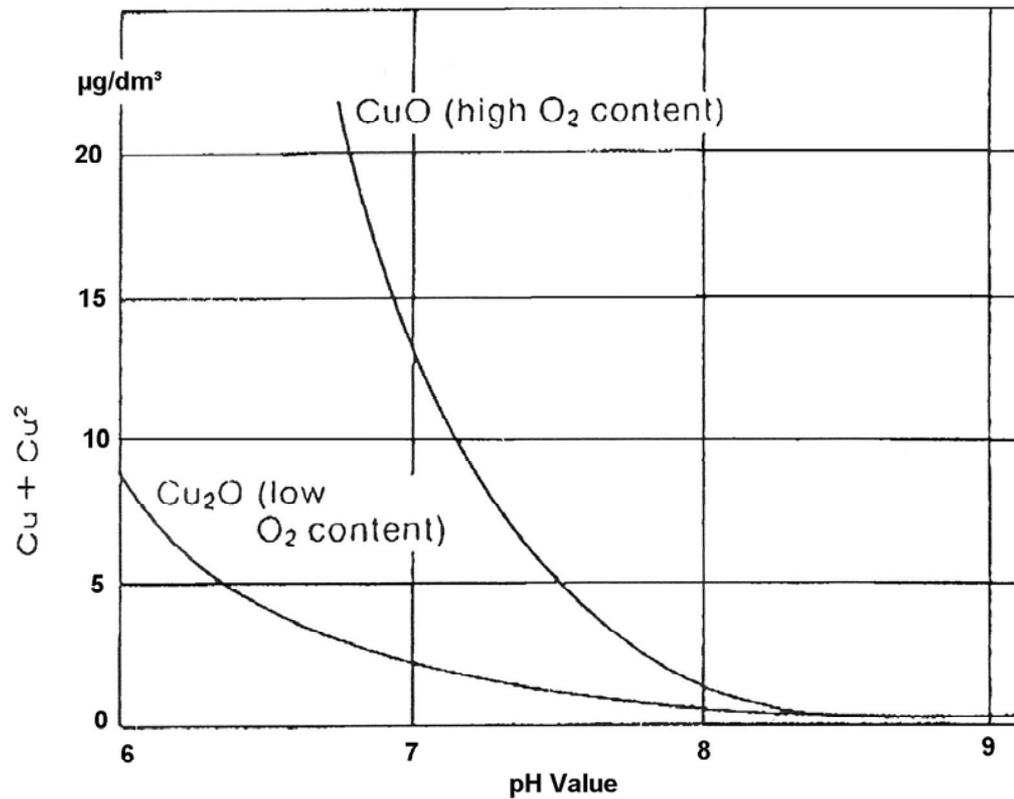


# COPPER, pH AND DO



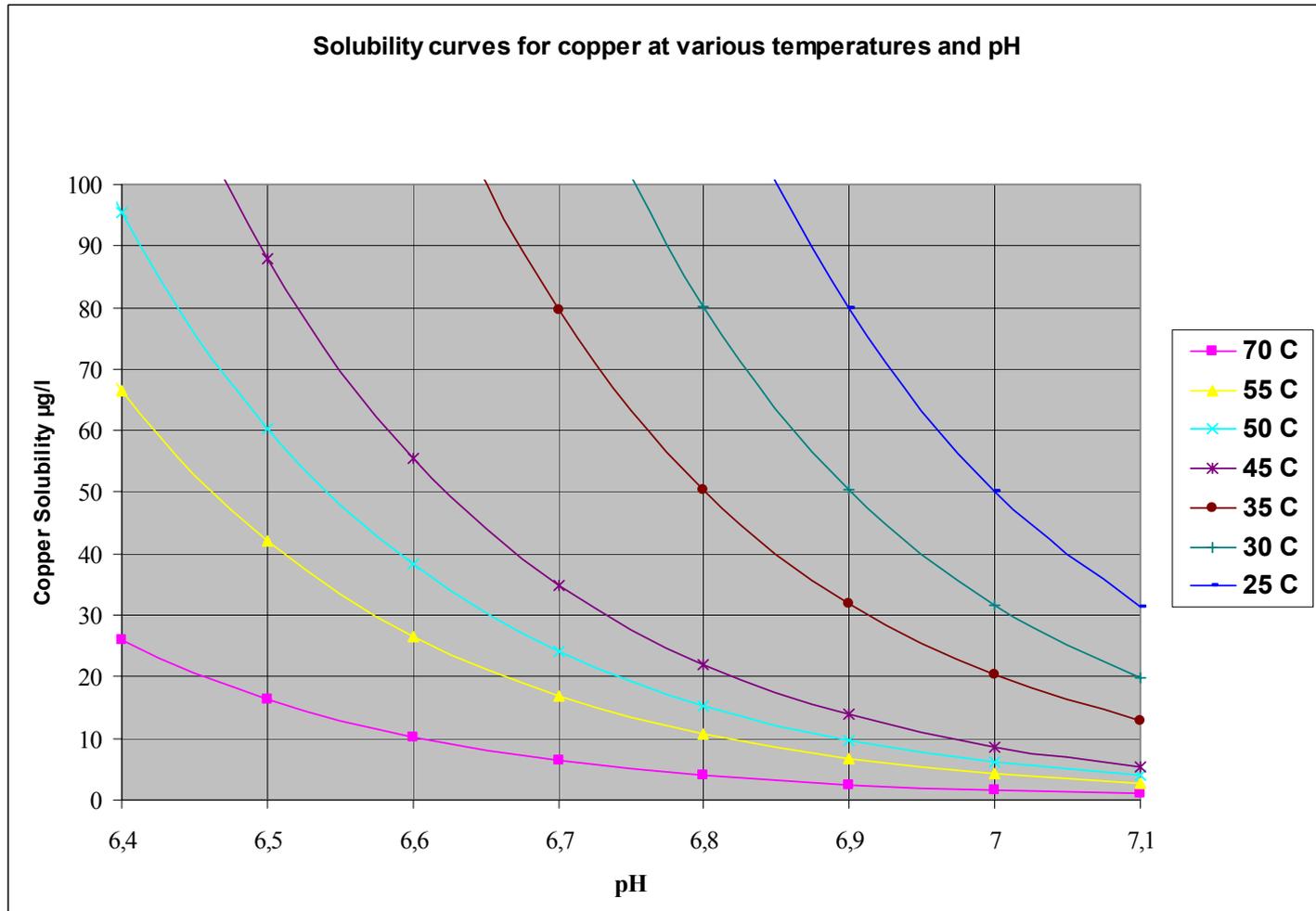


# COPPER OXIDE AND pH



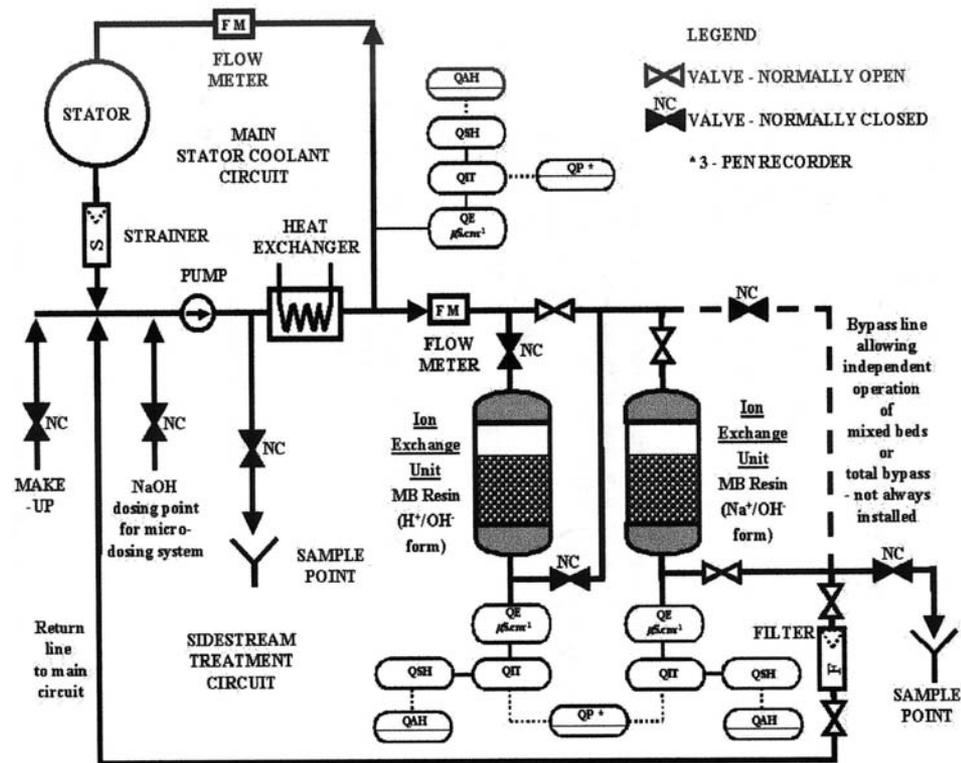


# COPPER, pH AND TEMPERATURE





# DUAL MIXED BED SYSTEM





# SUMMARY

- **Different chemistry regimes**
- **Elevated pH is the preferred chemistry at Eskom**
- **On-line analysis for conductivity, pH and dissolved oxygen**